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Lab. Project 5046-3 Pt.48
Final Report
NS 081-001

MATERIAL LABORATORY

NEW YORK NAVAL SHIPYARD

BROOKLYN 1, N. Y.

TECHNICAL REPORT

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CRITICAL THERMAL ENERGIES

of

DOPED FABRICS

Submitted by

THE WRIGHT AIR DEVELOPMENT CENTER
DEPT. OF THE AIR FORCE

L. Banet
J. Bracciaventi

Lab. Project 5046-3, Part 48
Final Report
NS 081-001
AFSWP-393

29 January 1954

Optics and Nucleonics Branch
J. M. McGREEVY, Head

Superintending Engineer
G. J. DASHEFSKY

The Director
CAPT. A. B. JONES, Jr. USN

MATERIAL LABORATORY
New York Naval Shipyard
Brooklyn 1, New York

ABSTRACT

For the purpose of evaluating the resistance of doped fabrics to the thermal radiation of atomic explosions, the critical thermal energies of several doped fabric assemblies, submitted by the Wright Air Development Center, Department of the Air Force, were determined by exposing the materials to the Naval Material Laboratory carbon-arc source of thermal radiation and examining the consequent damage. A plain cloth and a heat-treated Orlon which were variously treated with aluminum pigment and deposit and with cellulose acetate butyrate and cellulose nitrate coatings were evaluated.

It was found that the assemblies suffered complete destruction at radiant exposures ranging from 6.1 to 41 cal/cm^2, except for the Orlon fabric with cellulose acetate butyrate finish. This fabric, when exposed to 213 cal/cm^2, showed only slight carbonization and thinning. Aluminum-pigmented assemblies are not more resistant than the unpigmented doped fabric assemblies.

The most resistant standard cloth is that with a cellulose acetate butyrate finish, which shows initial effects at 10 cal/cm^2 and destruction at 33 cal/cm^2. The most vulnerable assembly is plain cloth with cellulose nitrate finish and aluminum pigment. Orlon is more resistant than the standard cloth; cellulose acetate butyrate gives considerably more protection than cellulose nitrate. The use of aluminum pigment or deposit does not increase the resistance of the fabrics.

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Ref: (a) COMNYKNAVSHIPYD Conf ltr S99/L5 Ser 960-92 of 14 Mar 1950
(b) BUSHIPS Rest. spdltr S99(0)(348) Ser 348-75 of 6 Apr 1950
(c) WADC ltr WCRTT-1 of 27 Mar 1953 to NML
(d) Final Report, NML Project 5046-3, Part 31, dated Jun 1953, Critical Thermal Energies of Doped Fabrics Submitted by the Wright Air Development Center

Encl: (1) Critical Thermal Energies of Doped Fabrics
(2) Critical Thermal Energies of Destruction of Doped Fabrics

AUTHORITY

1. This investigation is part of the program proposed by reference (a), and formally approved by reference (b). The investigation of the doped fabric assemblies was requested by reference (c). The general Thermal Radiation program is under the supervision of the Armed Forces Special Weapons Project.

INTRODUCTION

2. As part of its general program on the effects of the thermal radiation of atomic explosions, the Naval Material Laboratory is evaluating the characteristics under exposure to intense thermal radiation of the various materials of particular interest to the several agencies of the Department of Defense. As data become available, these findings are published.

3. Under reference (c), the Wright Air Development Center requested an evaluation of doped fabric assemblies. Several doped-fabric assemblies were evaluated previously, the results of which were published under reference (d). The materials under study in the present investigation include a plain cotton and a heat-treated Orlon cloth. Both cloths were coated in varying amounts with aluminum finishes and with cellulose acetate butyrate and cellulose nitrate.

EQUIPMENT AND METHODS

4. The critical thermal energies of the doped fabrics were determined, employing the Naval Material Laboratory carbon-arc source of thermal radiation. The source consists of an 11-mm carbon arc, mounted at the focus of a reflector which collimates the emitted energy. A second mirror which is mounted coaxially at a distance of twelve feet from the collimator, condenses the radiation to the mirror's focus. Gradations of thermal damage are obtained by varying the effective exposure time.

through accelerating a 1x8-inch specimen transversely through the focus. The carbon-arc source furnishes an irradiance of 85 cal/cm^2 sec over a central area, 2 mm in width. For a better approximation of the laboratory exposure time to those associated with the radiation of a nominal atomic bomb, absorbing screens were employed. Exposure times of between 0.3 and 0.6 seconds were employed for radiant exposures up to 53 cal/cm^2. In addition, in order to obtain higher exposures, times up to 2.4 sec were employed. The fabrics were cut into 1x8-inch strips and mounted on glass melamine blocks provided with cut-outs in the central area to furnish an air background. In order to reduce propagation of flame during exposure and in order to secure the specimens to the glass-melamine block serving as a base, a glass silicone mask with several stops was used over the fabrics.

RESULTS

5. The critical thermal energies of the doped fabrics, submitted by the Wright Air Development Center, were defined as those which produce certain characteristic , reproducible effects on the materials, such as charring or destruction. The measured critical energies are given in Enclosure (1).

6. It may be noted that the laboratory exposures have been made under highly controlled conditions and, as a rule, give results which can be reproduced very well. However, for several reasons, the data of Enclosure (1) should be used with caution. The effects to be observed on material surfaces remain unchanged over a considerable range of exposures. Since the surface effects are not sufficiently gradated for refined evaluations, only the initial stages have been recorded. The effects are influenced by such factors as mounting, geometry of material and of exposure, weathering, and the moisture content at the time of exposure. Differences in density, absorptivity, chemical composition, weave, and surface structure are responsible for the varying effects which may be observed from area to area on the same material. Liquids and gases form during exposure to thermal radiation, even in a period of less than one second, thereby affecting the amount of thermal radiation incident on and absorbed by the surface.

7. To indicate the influence of the base fabric and treatment, the critical thermal energies corresponding to destruction of the fabrics is indicated on Enclosure (2) in the order of increasing values. The base material and treatments used are listed.

CONCLUSIONS

8. The following conclusions are drawn from the results of this investigation:

a. Of the assemblies submitted, the black Orlon with clear acetate butyrate finish is the most resistant, since for radiant exposures up to 213 cal/cm^2 only the surface coating was destroyed and some carbonization and thinning of the Orlon occurred. The Orlon treated with aluminum pigment is considerably less resistant since the Orlon crumbles on handling after exposure to 41 cal/cm^2.

b. Of the remaining standard cloth fabrics, the most resistant is the cloth treated with cellulose acetate. Initial effects occur on this fabric at 10 cal/cm^2 and destruction at 33 cal/cm^2. The cellulose nitrate treatment causes lower resistance to thermal radiation than the cellulose acetate butyrate treatment.

c. The addition of aluminum deposit or pigment does not cause an appreciable increase in the resistance to thermal radiation. The least resistant of the fabrics has a cellulose nitrate finish with an aluminum pigment. Initial destructive effects on aluminum-pigmented fabrics occur at radiant exposures as low as 3.1 to 3.7 cal/cm^2.

RECOMMENDATIONS

9. In view of the results obtained above, it is recommended that additional investigations be carried out to determine the suitability of the submitted Orlon fabric with cellulose acetate butyrate finish. In particular, the mechanical and aging characteristics of the fabric assembly should be determined and its performance in general service should be evaluated.

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BIBLIOGRAPHY

1. Material Laboratory, New York Naval Shipyard. Critical Thermal Energies of Clothing Materials Submitted by the U.S. Marine Corps. Report No. 5046-3, Part 3 (July 1951)

2. Material Laboratory, New York Naval Shipyard. Critical Thermal Energies of Doped Fabrics Submitted by The Wright Air Development Center. Report No. 5046-3, Part 31 (June 1953)

3. Material Laboratory, New York Naval Shipyard. Determination of Intensity Distribution at the Focus of a Parabolic Mirror and the Energy Density on a Moving Surface Using a Tungsten Lamp Source. Report No. 5046, Part 5 (July 1949)

4. Material Laboratory, New York Naval Shipyard. Evaluation of Thermal Effects on Specimens Exposed at Bikini. Report No. 5046, Part 7 (March 1950)

5. Material Laboratory, New York Naval Shipyard. A Method of Measuring High Intensities at the Focus of a Parabolic Reflector With Large Aperture. Report No. 5046, Part 3 (November 1948)

Approved:

A. B. JONES, Jr., CAPTAIN, USN
The Director

CRITICAL THERMAL ENERGIES
of
DOPED FABRICS SUBMITTED BY
THE WRIGHT AIR DEVELOPMENT CENTER
DEPARTMENT OF THE AIR FORCE

WADC Designation	Material (WADC Designation)	Description of Effect	Critical Energy (Cal/cm^2)
A	Plain cloth, clear cellulose acetate butyrate	Dulling of surface	10
		Charring	18
		Destruction by slowly propagating flame	33
B	Plain cloth, aluminum pigment	Dulling of surface	3.2
		Charring	8.4
		Destruction by slowly propagating flame	21
C	Black Orlon, aluminum pigment	Dulling of surface	3.7
		Destruction of surface coat and exposure of fabric	18
		Brittleness and crumbling of Orlon	41
D	Black Orlon, clear coat cellulose acetate butyrate	Dulling of surface	2.7
		Destruction of surface coat, slight thinning and carbonization of fabric, but without destruction of Orlon	up to 213
E	Plain cloth, aluminum deposit and pigment, cellulose nitrate	Dulling of surface	3.1
		Burning of surface, accompanied by shortly sustained flame after exposure, charring of fabric	3.7
		Brittleness and crumbling of fabric	7.4

WADC Designation	Material (WADC Designation)	Description of Effect	Critical Energy (Cal/cm^2)
F	Plain cloth, aluminum deposit and pigment, cellulose acetate butyrate	Dulling of surface	3.6
		Destruction of surface coat, exposure of gold colored coat on fabric	7.6
		Charring of fabric	10
		Charring and brittleness of fabric	13
G	Plain cloth, aluminum pigment, cellulose nitrate	Dulling of surface	3.4
		Burning of surface, short after flame	3.9
		Brittleness and crumbling of fabric	6.1
H	Plain cloth, aluminum pigment, cellulose acetate butyrate	Dulling of surface	4.8
		Destruction of surface coat and charring of fabric	7.2
		Brittleness and crumbling of fabric	9.2 - 11

CRITICAL THERMAL ENERGIES OF DESTRUCTION
OF DOPED FABRICS SUBMITTED BY
THE WRIGHT AIR DEVELOPMENT CENTER

Fabric Design (WADC)	Material	Color	Treatment With				Destroyed at (Cal/cm^2)
			C.N.	Al.pigm.	Al.dep.	C.A.B.	
G	Plain cloth	Alum.	X	X			6.1
E	" "	"	X	X	X		7.4
H	" "	"		X			9.2-11
F	" "	"		X	X	X	13
B	" "	"		X			21
A	" "	Glossy white				X	33
C	Orlon	Alum.		X			41
D	Orlon	Glossy black				X	(not up to 213)

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